CLAIMS:

1. A naval virtual target range system, comprising:

    a control subsystem operatively connected to a naval weapon system and having a computer system including:

    means for implementing a three-dimensional graphical view of a naval virtual target range for use in conjunction with a naval weapon system fire exercise; and

    means for calculating results of the naval weapon system fire exercise from selective data provided by the naval weapon system; and

    a spotter subsystem operatively connected to the control subsystem and having a spotter subsystem display for viewing three-dimensional graphic results of the naval weapon system fire exercise generated by the computer system.

2. The naval virtual target range system of claim 1, wherein the computer system further includes a terrain database storing a plurality of geographic formation implementations and a target database storing a plurality of physical object implementations, and wherein the naval virtual target range is implemented from implementations stored in the terrain database and the target database.

3. The naval virtual target range system of claim 1, further comprising a buoy subsystem including at least three sensors, that determines impact points of the naval weapon system fire exercise relative to the buoy subsystem, and wherein the buoy subsystem is operatively connected to the control subsystem to also provide data to the control subsystem for calculating results of the naval weapon system fire exercise.

4. The naval virtual target range system of claim 3, wherein the buoy subsystem has a global positioning system and each of the at least three sensors is selected from a group of sensors consisting of radar and acoustic sensors, and wherein the buoy subsystem records the time when a sensor perceives an impact sound and the location of the sensor.

5. The naval virtual target range system of claim 1, further comprising an aerial subsystem including an aerial vehicle having a combination of a camera system and radar,

that determines impact points of the naval weapon system fire exercise relative to the aerial vehicle, and wherein the aerial vehicle is operatively connected to the control subsystem to also provide data to the control subsystem for calculating results of the naval weapon system fire exercise.

6.   The naval virtual target range system of claim 5, wherein the camera system is selected from a group of camera systems consisting of a charged-coupled device camera, a digital television camera, an infrared camera, and a combination of these, wherein the radar is a millimeter-wave radar, and wherein each view point on the plane of a camera view is associated with a line segment between the view point and the center point of the camera view and with a directional number associated with the line segment.

7.   The naval virtual target range system of claim 5, wherein the control subsystem detects significant changes in visual data, and wherein an outline of a change has a major axis that is used to find an impact point of ordnance launched during the fire exercise.

8.   The naval virtual target range system of claim 1, wherein data collected from the naval fire exercise by the control subsystem is used by the control subsystem to find and map impact points of ordnance launched during the fire exercise, calculate trajectories of the ordnance from the data and the impact points, and calculate virtual impact points on the naval virtual target range from the data, the trajectories, and the naval virtual target range implementation.

9.   A naval virtual target range system control subsystem operatively connected to a naval weapon system and having a computer system comprising:

        a terrain database storing a plurality of geographic formation implementations;

        a target database storing a plurality of physical object implementations;

        means for implementing a three-dimensional graphical view of a naval virtual target range from implementations stored in the terrain database and the target database, for use in conjunction with a naval weapon system fire exercise; and

14

means for calculating results of the naval weapon system fire exercise from selective data provided by the naval weapon system.

10. The naval virtual target range system of claim 7, further comprising a spotter subsystem operatively connected to the control subsystem and having a spotter subsystem display for viewing three-dimensional results of the naval weapon system fire exercise generated by the computer system.

11. The naval virtual target range system of claim 7, further comprising a buoy subsystem including at least three sensors, that determines impact points of the naval weapon system fire exercise relative to the buoy subsystem, and wherein the buoy subsystem is operatively connected to the control subsystem to also provide data to the control subsystem for calculating results of the naval weapon system fire exercise.

12. The naval virtual target range system of claim 9, wherein the buoy subsystem has a global positioning system and each of the at least three sensors is selected from a group of sensors consisting of radar and acoustic sensors, and wherein the buoy subsystem records the time when a sensor perceives an impact sound and the location of the sensor.

13. The naval virtual target range system of claim 7, further comprising an aerial subsystem including an aerial vehicle having a combination of a camera system and radar, that determines impact points of the naval weapon system fire exercise relative to the aerial vehicle, and wherein the aerial vehicle is operatively connected to the control subsystem to also provide data to the control subsystem for calculating results of the naval weapon system fire exercise.

14. The naval virtual target range system of 11, wherein the camera system is selected from camera systems consisting of a charged-coupled device camera, a digital television camera, an infrared camera, and a combination of these, wherein the radar is a millimeter-wave radar, and wherein each view point on the plane of a camera view is associated with a

line segment between the view point and the center point of the camera view and with a directional number associated with the line segment.

15. A naval virtual target range system, comprising:

a control subsystem operatively connected to a naval weapon system and having a computer system including:

means for implementing a three-dimensional graphical view of a naval virtual target range for use in conjunction with a naval weapon system fire exercise; and

means for calculating results of the naval weapon system fire exercise from selective data provided by the naval weapon system and at least three sensors;

a buoy subsystem including the at least three sensors, that determines impact points of the naval weapon system fire exercise relative to the buoy subsystem, and wherein the buoy subsystem is operatively connected to the control subsystem to provide data to the control subsystem; and

a spotter subsystem operatively connected to the control subsystem and having a spotter subsystem display for viewing three-dimensional results of the naval weapon system fire exercise generated by the computer system.

16. The naval virtual target range system of claim 13, wherein the computer system further includes a terrain database storing a plurality of geographic formation implementations and a target database storing a plurality of physical object implementations, and wherein the naval virtual target range is implemented from implementations stored in the terrain database and the target database.

17. The naval virtual target range system of claim 14, wherein the buoy subsystem has a global positioning system and each of the at least three sensors is selected from a group of sensors consisting of radar and acoustic sensors, and wherein the buoy subsystem records the time when a sensor perceives an impact sound and the location of the sensor.

18. A naval virtual target range system, comprising:

a control subsystem operatively connected to a naval weapon system and having a computer system including:

means for implementing a naval virtual target range for use in conjunction with a naval weapon system fire exercise; and

means for calculating results of the naval weapon system fire exercise from selective data provided by the naval weapon system and a combination of a camera system and radar; and

an aerial vehicle including the combination of a camera system and radar, that determines the impact points of the naval weapon system fire exercise relative to the aerial vehicle, and wherein the aerial vehicle is operatively connected to the control subsystem to also provide data to the control subsystem.

19.   The naval virtual target range system of claim 16, wherein the computer system further includes a terrain database storing a plurality of geographic formation implementations and a target database storing a plurality of physical object implementations, and wherein the naval virtual target range is implemented as a three-dimensional graphical view from implementations stored in the terrain database and the target database.

20.   The naval virtual target range system of claim 16, further comprising a spotter subsystem operatively connected to the control subsystem and having a spotter subsystem display for viewing three-dimensional results of the naval weapon system fire exercise generated by the computer system.

21.   The naval virtual target range system of claim 16, wherein the camera system is selected from a group of camera systems consisting of a charged-coupled device camera, a digital television camera, an infrared camera, and a combination of these, wherein the radar is a millimeter-wave radar, and wherein each view point on the plane of a camera view is associated with a line segment between the view point and the center point of the camera view and with a directional number associated with the line segment.

22.   A method of operating a naval virtual target range system, comprising:

provinding a naval virtual target range system including:

a control subsystem operatively connected to a naval weapon system and having a computer system programmed for implementing a three-dimensional graphical view of a naval virtual target range and programmed for calculating results of a naval weapon fire exercise; and

a spotter subsystem operatively connected to the control subsystem and having a spotter subsystem display;

using the control subsystem to implement a naval virtual target range;

displaying the naval virtual target range on the spotter subsystem display;

conducting a naval weapon system fire exercise;

providing data about the naval weapon system fire exercise from the naval weapon system to the control subsystem;

using the control subsystem to calculate results about the naval weapon system fire exercise; and

displaying the results on the spotter subsystem display.

23.   The method of claim 20, further comprising the steps of providing a buoy subsystem including means for collecting data about a live naval weapon system fire exercise and providing at least some collected data to the control subsystem for calculating results of the naval weapon fire exercise.

24.   The method of claim 20, further comprising the steps of providing an aerial subsystem including means for collecting data about a live naval weapon system fire exercise and providing at least some collected data to the control subsystem for calculating results of the naval weapon fire exercise.

25.   A naval virtual target range system, comprising:

    means for implementing a naval virtual target range for use in conjunction with a naval weapon system fire exercise;

    means for calculating results of the naval weapon system fire exercise; and

    means for a spotter to view three-dimensional results of the naval weapon system fire exercise.

26.   A naval virtual target range system of claim 22, further comprising a means for collecting data about a live naval weapon system fire exercise.